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<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	09/281,365	
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	First Named Inventor	Darren D. NEUMAN	
	Art Unit	2644	
	Examiner Name	Ping LEE	
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Date	June 18, 2004

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AP

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: Darren D. NEUMAN § Confirmation No.: 7152  
Serial No.: 09/281,365 § Group Art Unit: 2644  
Filed: March 30, 1999 § Examiner: Ping LEE  
For: Audio Calibration System § Attorney Docket No.: 5201-19401

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**AMENDED APPEAL BRIEF**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

June 18, 2004

Dear Sir:

This paper is submitted in response to the Notification of Non-Compliance (of a previously filed appeal brief) mailed June 3, 2004. Applicants are appealing the examiner's final rejection of claims 1-4, 6-14, 16-18, 20 and 21 as set forth in the Final Office Action of December 1, 2003.

This paper includes the following sections:

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**REAL PARTY IN INTEREST**

The real party in interest is the assignee: LSI Logic Corporation.

**RELATED APPEALS AND INTERFERENCES**

No other appeals or interferences are known to the applicant, the applicant's legal representative, or the assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in an appeal on this case.

**STATUS OF CLAIMS**

Originally filed claims:	1-24
Canceled claims:	5, 15, 19 and 22-24
Presently pending claims:	1-4, 6-14, 16-18, 20 and 21
Allowed claims:	None
Rejected claims (appealed herein):	1-4, 6-14, 16-18, 20 and 21

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**STATUS OF AMENDMENTS**

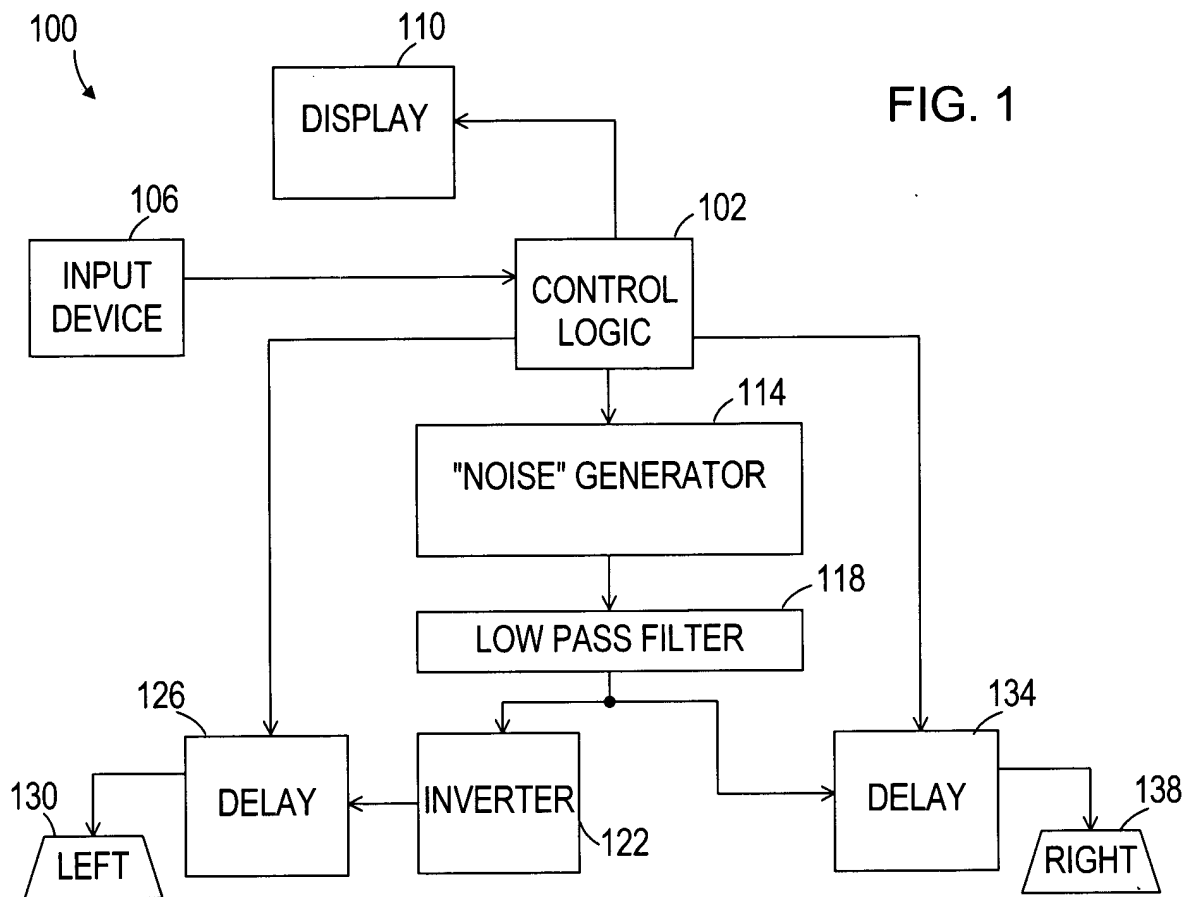
No amendments are pending.

**SUMMARY OF THE INVENTION**

Applicant's invention generally relates to an audio calibration system and more particularly to a technique for calibrating an audio system for any desired listening location. 1/19-20.<sup>1</sup> On the next page, Fig. 1 is reproduced alongside claim 1. To aid in comparing the claim to the figure, reference numerals from the figure have been added to the claim.

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<sup>1</sup> In this discussion, citations are made to the patent specification using an abbreviated notation for page and line number(s). Thus "1/19-20" stands for "page 1, lines 19-20".



1. An audio calibration system [100], comprising:

a control logic [102];

an input device [106] coupled to said control logic [102];

a display [110] coupled to said control logic [102];

a noise generator [114] for generating a substantially random noise signal and coupled to said control logic [102];

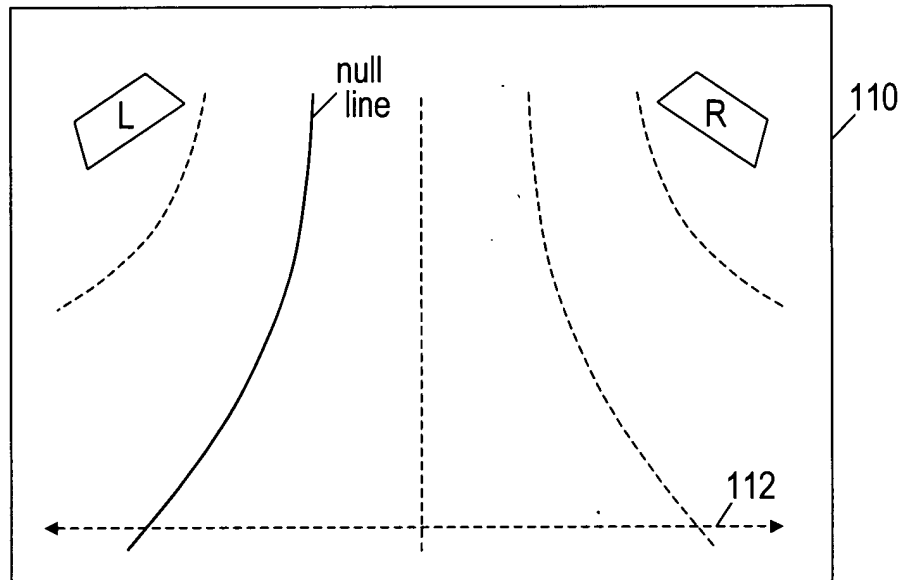
a plurality of speakers [130, 138] coupled to said noise generator [114]; and

delay modules [126, 134] coupled between said noise generator [114] and said plurality of speakers [130, 138] for introducing time delays in the sound produced by the speakers,

wherein said control logic [102] causes said display [110] to display a visual image that indicates the relative position of a null line, wherein the position of the null line is determined by the time delays of the delay modules.

The last limitation of claim 1 recites "a visual image that indicates the relative position of a null line". The null line is a set of points where opposite audio signals (i.e., one audio signal is inverted relative to the other) cancel each other. 8/10-17. When one of the audio signals is delayed relative to the other, the position of the null line moves closer to the source of the delayed signal. 9/10-12. Fig. 6 (reproduced below) shows an illustrative visual image that indicates the relative position of the null line. 10/15 to 11/2.

FIG. 6



Referring back to Fig. 1, independent claim 7 specifically recites "an inverter [122] coupled between said noise generator [114] and at least one delay module [126]."

Independent claim 9 specifically recites "a low pass filter [118] coupled to said noise generator [114] for filtering the random noise signal." (As explained in the application, the low pass filter advantageously "widens" the region of reduced sound level on either side of the null line to facilitate the user's detection of the null line during the tuning process. 10/11-13.)

Independent claim 16 extends the null-line tuning concept to a multi-speaker audio system in which a reference speaker is used to create a null-line with at least two other speakers.

Independent claim 18 recites, as part of a tuning step, processing an audio signal from a microphone to determine a minimum amplitude level. (As explained in the application, this alternative allows electronic determination of nulls rather than relying on manual tuning. 13/11-15.)

### PRIOR PROCEEDINGS

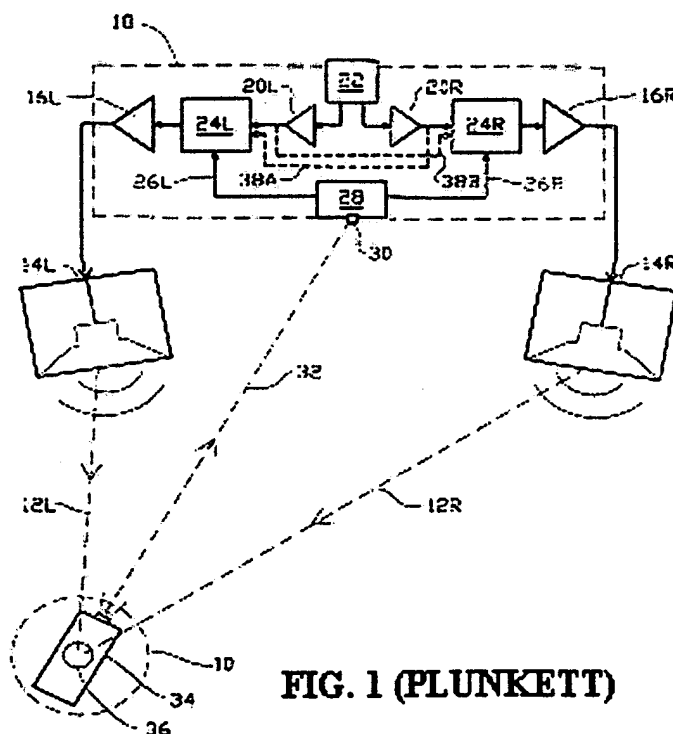
In the Final Office Action mailed December 1, 2003, the Examiner rejected claims 1-4, 6-14, 16-18, 20 and 21 under 35 U.S.C. § 103(a) as being allegedly unpatentable over US Pat. No. 5,386,478 ("Plunkett") in view of U.S. Pat. No. 5,778,087 ("Dunlavy").

### SUMMARY OF CITED ART

#### U.S. PAT. NO. 5,386,478 ("Plunkett")

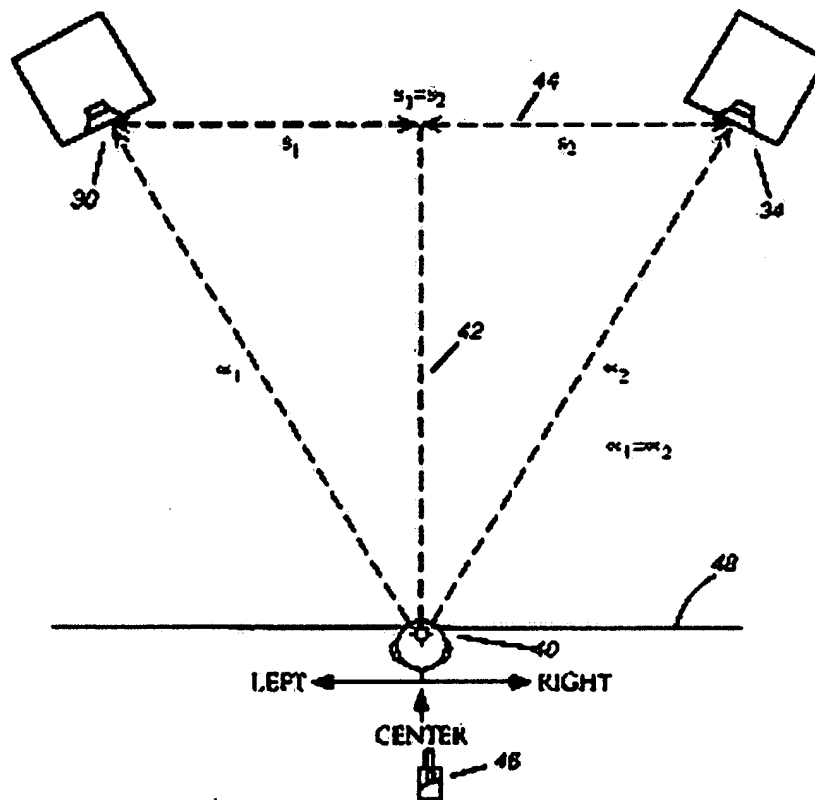
Plunkett teaches automatic stereo adjustment by incorporating an acoustic sensor in a hand-held remote control unit. 1/60-65. The microphone, which is located at the listening location, picks up a special test signal generated from the loudspeakers on command. 1/65-68. Based on an analysis of the signal picked up by the microphone, corrective adjustment of the stereo unit is introduced. 1/68 - 2/2.

Plunkett's Fig. 1 (shown below) is a simplified functional block diagram of a stereo system equipped to operate in accordance with the invention of Plunkett. 2/24-26. The stereo system depicted in FIG. 1 includes channel control modules 24L and 24R, command module 28 and remote control unit 34 at listening location 10. 2/37-45.



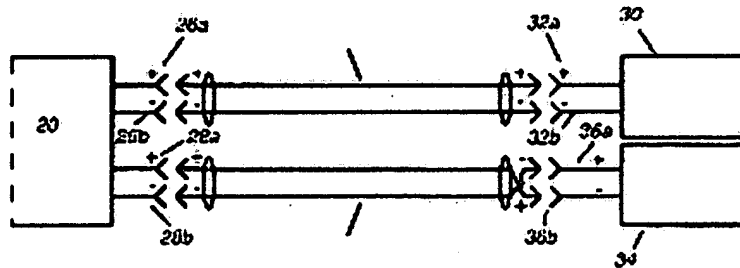
U.S. PAT. NO. 5,778,087 ("Dunlavy")

Dunlavy teaches a method for stereo loudspeaker placement. 4/51-52. The method includes: applying an acoustic signal to a set of loudspeakers, measuring the combined sound level of the acoustic signals at the principal listening location, and adjusting the location of the loudspeakers to produce a null at the principal listening position. 4/52-67. Dunlavy's Fig. 4 (shown below) illustrates the relative placement of the left and right stereo speakers (30, 34) in relation to a principal listening position 40. 3/54-58. Dunlavy employs a set-up indicator 46 to measure the combined sound level created by loudspeakers 30 and 34 at principal listening position 40.



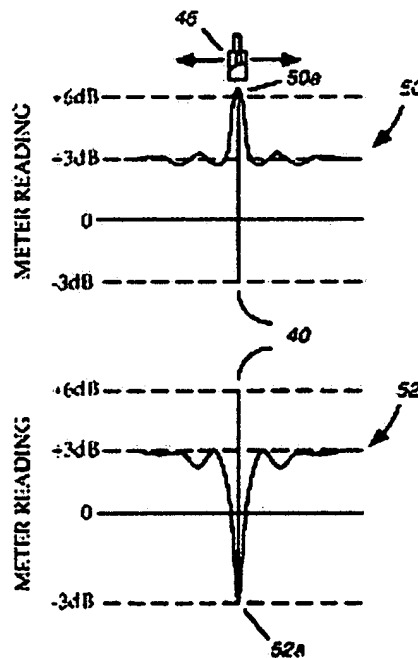
**FIG. 4 (DUNLAVY)**

Dunlavy also teaches a stereo reproduction system having connections that ensure that the acoustic signals radiated by both loudspeakers are "out-of-phase" relative to each other, as depicted in Fig. 3-B, below.



**FIG. 3-B (DUNLAVY)**

Dunlavy further illustrates the "null" measurement of set-up indicator 46 using the graph shown in Fig. 5, below. 4/1-30.



**FIG. 5 (DUNLAVY)**

### ISSUES

1. A prima facie case of obviousness requires, among other things, that the prior art reference (or references when combined) must teach or suggest all the claim limitations. Has the examiner indeed established a case of prima facie obviousness in the rejection of claims 1-4 and 6?
2. Has the examiner established prima facie obviousness of claims 7?
3. Has the examiner established prima facie obviousness of claims 8-14 and 20-21?
4. Has the examiner established prima facie obviousness of claims 16-17?
5. Has the examiner established prima facie obviousness of claim 18?

### GROUPING OF CLAIMS

Claims 1-4 and 6 stand or fall together.

Claim 7 stands or falls alone.

Claims 8-14 and 20-21 stand or fall together.

Claims 16-17 stand or fall together.

Claim 18 stands or falls alone.

### ARGUMENT

#### Issue 1: Lack of Prima Facie Obviousness of Claims 1-4 and 6

To make a rejection under § 103, the examiner must establish a prima facie case of obviousness. *See* MPEP 2142.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

MPEP 2143.03 (emphasis added). Applicants respectfully submit that the examiner has not established a prima facie case of obviousness because the cited art does not teach or suggest all the claim limitations.

Independent claim 1 recites an audio calibration system “wherein said control logic causes said display to display a visual image that indicates the relative position of a null line, wherein the position of the null line is determined by the time delays of the delay modules”. As stated above, prima facie obviousness requires a showing that the references when combined teach or suggest all the claim limitations.

As the examiner concedes, Plunkett fails to show any display. (See Final Office Action; page 2, para. 1). Rather, the examiner cites Dunlavy’s indicator 46 (See Dunlavy Fig. 4 and col. 3, lines 60-67), characterizing it as a sound level meter and further equating such a meter to a visual indicator for determining the null. Dunlavy’s specification describes the indicator as a conventional meter capable of measuring combined sound levels. The specification does not describe indicator 46 as a display for indicating the relative position of a null line. One of ordinary skill would regard such a conventional sound level meter as giving only an indication of the sound level at a given point. This is made clear in Dunlavy’s Fig. 5, which shows a graph representing the variations in signal amplitude measured by indicator 46. Col. 3, lines 4-6. As implied by the arrows to the left and right of indicator 46, graph 50 represents an aggregate of data acquired by moving indicator 46 about principal listening position 40. Col. 4, lines 1-30.

By contrast, applicant’s Fig. 6 shown above is a visual image that does indicate the relative position of a null line. Such an image may be shown on display 110 (Applicant’s Fig. 1) to indicate the relative location of a null line.

Therefore, applicant asserts that the combined teachings of Dunlavy and Plunkett do not teach or suggest a display that shows “a visual image that indicates the relative position of a null line.” For at least this reason, applicant asserts that independent claim 1 and its dependent claims 2-4 and 6, are allowable over the cited art.

## **Issue 2: Lack of Prima Facie Obviousness of Claim 7**

Independent claim 7 recites “an inverter coupled between said noise generator and at least one delay module”. Plunkett does not teach an inverter coupled between a noise generator and a delay module. To anticipate this limitation, the examiner cites Dunlavy’s “out-of-phase” wiring configuration in which two speaker wires are crossed over as shown in Dunlavy’s Fig. 3-B. With

reference to Dunlavy's Fig. 3-B and Fig. 4 (*supra*, page 6), the examiner maintains that the crossed wires at 36a and 36b show the inverter located between a noise generator 20 and a delay that consists of the space between the speakers 30, 34 and a microphone (listening position 40). Final Office Action; page 3, para. 2.

Applicant maintains that the space between Dunlavy's loudspeakers 30, 34 and principal listening position 40 is not suggestive of delay modules for introducing time delays in the sound produced by the speakers as recited in applicant's claims 7 and 9. As such, Dunlavy cannot teach an inverter between a noise generator and a delay module because the examiner has not shown that Dunlavy even teaches a delay module.

Therefore, because the combined references do not teach or suggest all the claim limitations, the examiner has failed to make a prima facie case of obviousness. For at least this reason, applicant submits that independent claim 7 and its dependent claim 8 are allowable over the cited art.

### **Issue 3: Lack of Prima Facie Obviousness of Claims 8-14 and 20-21**

Independent claim 9 recites "a low pass filter coupled to said noise generator for filtering the random noise signal". To anticipate this limitation, the examiner cites Dunlavy, saying "Dunlavy teaches only a portion of the noise signal within the audible sound spectrum is needed for calibration". Final Office Action; page 3, para. 3. Accepting this statement for the sake of argument, this teaching still falls far short of suggesting what portion of the spectrum should be used and how to obtain a signal having such a spectrum. The above quoted claim limitations are simply absent from the cited art. For at least this reason, independent claim 9 and its dependent claims 10-14 are allowable over the cited art. Dependent claim 8 and independent claim 20 recite similar limitations. Accordingly, these claims and dependent claim 21 are allowable over the cited art for at least the same reason.

### **Issue 4: Lack of Prima Facie Obviousness of Claims 16 and 17**

Independent claim 16 extends the null-line tuning concept to multi-speaker systems, reciting "tuning a time delay ... to adjust the location of a null line caused by said reference and

first speakers" and "tuning a time delay ... to adjust the location of a null line caused by said reference and second speakers". The examiner asserts "the well known surround sound home theater system also would benefit from using the audio calibration system as taught [by] Plunkett to compensate the unequal delay posed by three or more different speakers. Thus, it would have been obvious." Final Office Action; page 4, para. 4 to page 5, para. 1.

Plunkett's teachings do not rely on null line measurements. Rather, Plunkett teaches measuring arrival times of pulses from left and right speakers. Arguably, one of ordinary skill in the art would perceive an extension of such teachings to multi-speaker systems as obvious. However, such an extension is not obvious for tuning approaches that depend on null line measurements. As mentioned in the application, additional speakers will cause the null line to become a "null point". 11/8-10. The cited art fails to teach or suggest how null-position tuning could be applied in such a system; indeed, without the benefit of applicant's teachings, one of ordinary skill in the art would probably consider it infeasible. Thus applicant's claim 16 recites a sequential null-line tuning approach which is simply not taught or suggested by the cited art. For at least this reason, independent claim 16 and its dependent claim 17 are allowable over the cited art.

#### **Issue 5: Lack of Prima Facie Obviousness of Claim 18**

Independent claim 18 recites in part "receiving an audio signal from a microphone; and processing said audio signal to determine a minimum amplitude level". The examiner fails to address this limitation, and applicants can find no teaching or suggestion of this limitation in the cited art. Because the burden rests upon the examiner to establish a prima facie case, applicants submit that this rejection is improper and should be withdrawn. See, e.g., *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed.Cir.1992) ("[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability.... If examination at the initial stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent."). For at least this reason, independent claim 18 is allowable over the cited art.

**Appl. No.: 09/281,365**

**Amended Appeal Brief dated June 18, 2004**

**Reply to Notification Of Non-Compliance With 37 CFR 1.192(c)**

**Conclusion**

In view of the arguments set out above, applicant respectfully requests that the 35 USC 103(a) rejections be reversed by the Board. If any fees are inadvertently omitted or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to LSI Logic Deposit Account Number 12-2252/5201-19401/DJK.

Respectfully submitted,



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Agent for Applicant

**APPENDIX**

1. An audio calibration system, comprising:

a control logic;

an input device coupled to said control logic;

a display coupled to said control logic;

a noise generator for generating a substantially random noise signal and coupled to said control logic;

a plurality of speakers coupled to said noise generator; and

delay modules coupled between said noise generator and said plurality of speakers for introducing time delays in the sound produced by the speakers,

wherein said control logic causes said display to display a visual image that indicates the relative position of a null line, wherein the position of the null line is determined by the time delays of the delay modules.

2. The audio calibration system of claim 1 wherein the substantially random noise signal has an auto correlation of 0.

3. The audio calibration system of claim 1 wherein the substantially random noise signal is pseudo-random.

4. The audio calibration system of claim 1 wherein said plurality of speakers includes five speakers.

6. The audio calibration system of claim 1 wherein said input device is wirelessly coupled to said control logic.

7. An audio calibration system, comprising:

- a control logic;
- an input device coupled to said control logic;
- a display coupled to said control logic;
- a noise generator for generating a substantially random noise signal and coupled to said control logic;
- a plurality of speakers coupled to said noise generator;
- delay modules coupled between said noise generator and said plurality of speakers for introducing time delays in the sound produced by the speakers; and
- an inverter coupled between said noise generator and at least one delay module.

8. The audio calibration system of claim 7 further including a low pass filter coupled between said noise generator and said delay modules for low pass filtering the noise signal.

9. An audio calibration device, comprising:

- a control logic;
- an input device coupled to said control logic;
- a noise generator for generating a substantially random noise signal and coupled to said control logic;
- a low pass filter coupled to said noise generator for filtering the random noise signal from said noise generator;
- an inverter coupled to said low pass filter;
- a first delay module coupled to said inverter for introducing a time delay into an output signal from said inverter; and
- a second delay module coupled to said low pass filter for introducing a time delay into an output signal from said filter, wherein said control logic controls the amount of time delay introduced by each delay module to thereby vary the location of a null line.

10. The audio calibration device of claim 9 further including a display unit coupled to the control logic for displaying a visual image indicative of the relative location of the null line.

11. The audio calibration device of claim 10, wherein said display unit includes an on-screen display controller implemented in a DVD decoder.

12. The audio calibration device of claim 10 further including a sound detector coupled to said control logic, said control logic determines the presence of the null line by processing an audio signal from said sound detector.

13. The audio calibration device of claim 10, wherein said noise generator and low pass filter are implemented using digital signal processing.

14. The audio calibration system of claim 10 further including speakers respectively coupled to said delay modules.

16. A method for calibrating an audio system including multiple speakers, comprising:  
    providing substantially random noise to a reference speaker and a first speaker;  
    tuning a time delay to one of the speakers provided with substantially random noise to adjust the location of a null line caused by said reference and first speakers;  
    providing substantially random noise to said reference speaker and a second speaker; and  
    tuning a time delay to one of the reference or second speakers to adjust the location of a null line caused by said reference and second speakers.

17. The method of claim 16 further including:  
    providing substantially random noise to said reference speaker and a third speaker; and  
    tuning a time delay to one of the reference or second speakers to adjust the location of a null line caused by said reference and third speakers.

18. A method for calibrating an audio system including multiple speakers, comprising:
- providing substantially random noise to a reference speaker and a first speaker; and
  - tuning a time delay to one of the speakers provided with substantially random noise to adjust the location of a null line caused by said reference and first speakers, wherein said tuning step includes:
    - receiving an audio signal from a microphone; and
    - processing said audio signal to determine a minimum amplitude level.
20. An audio calibration system, including:
- a means for generating a substantially random noise signal;
  - a delay means coupled to said noise signal generating means for introducing time delays in the substantially random noise signal;
  - a means for controlling the amount of time delay introduced by said delay means to control the location of a null point; and
  - a filtering means coupled to said noise signal generating means for low pass filtering the substantially random noise signal
21. The audio calibration system of claim 20 further including a means for displaying the relative location of the null point.